IMPACT OF SMRs ON THE REGULATORY FRAMEWORK : An Operator's Perspective

WINS Workshop on the Security of Small Modular Reactors | November 20th, 2019

ONTARIO POWER GENERATION

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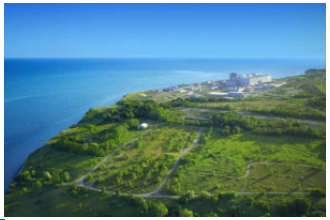
OPG Who We Are

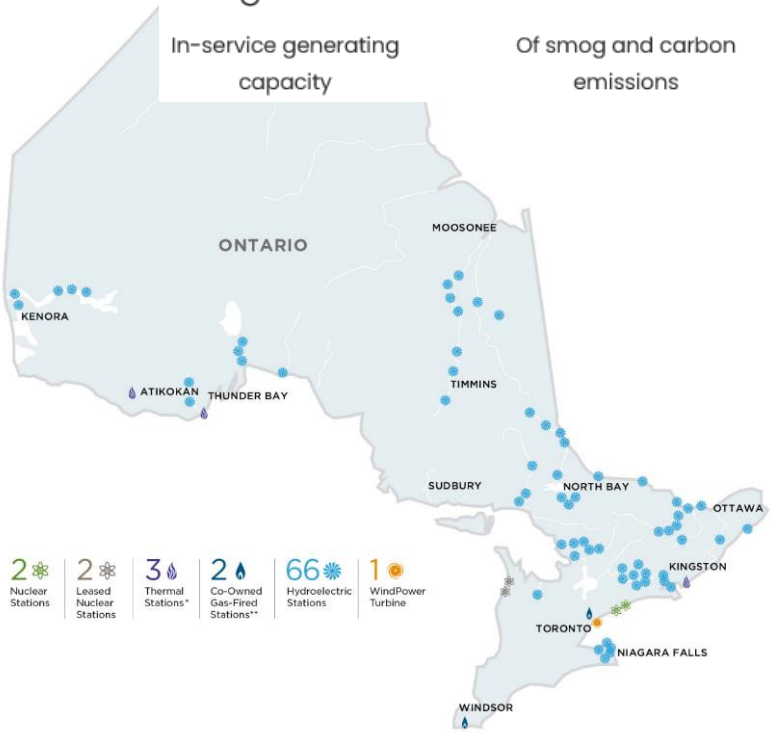
16,295
Megawatts
In-service generating capacity

90% +
Free
Of smog and carbon emissions

40%
Average
Lower cost than power from other generators

9,300 +
Skilled
Employees supporting Ontario's economy





Recap of SMR Roadmap

Regulatory Readiness Working Group

Final Report

- **Key Recommendation #2:** Revise the Security Regulations to cover high level principles similar to other regulations and remove prescriptive requirements. CNSC REGDOC should then be produced providing necessary details and including the concept of a graded approach.

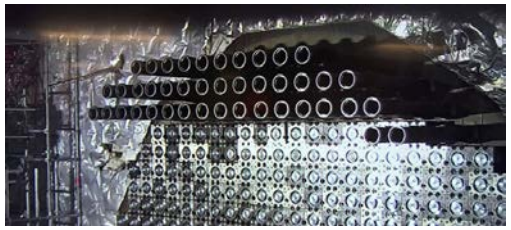
Operator's Perspective on Regulatory Frame Work

Present

- Nuclear Security Regulations set out security requirements. These security requirements apply to the large conventional nuclear power plants that operate in Canada today.
- The regulations generally permit a measure of flexibility in the use of alternative approaches and permit the application of a graded approach.
- However, overall these requirements remain largely prescriptive in both the required physical barriers and intrusion detection systems as well as the need for a continuous armed response force.
- Implementation of these requirements could prove onerous for smaller SMR facilities, particularly those located in remote locations.

Operator's Perspective on Regulatory Frame Work

Future



Refurbishment of Existing Facilities

+

Evolving Threat Environment

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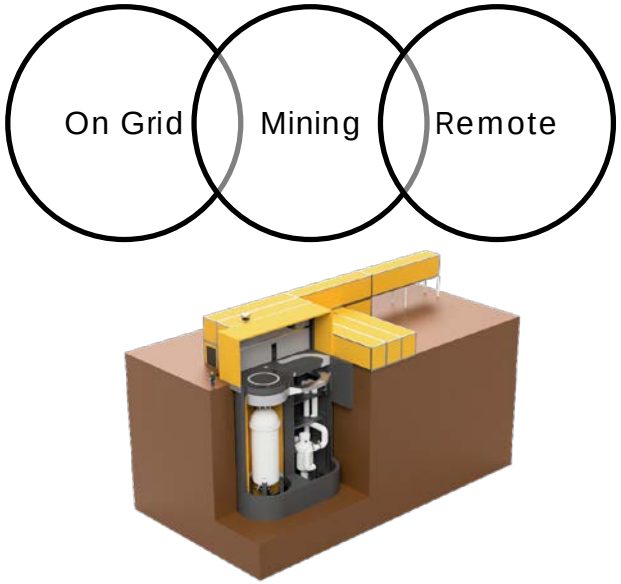

Potential For SMRs in a variety of applications

To Deal with these conditions the Regulatory Framework Around Security must be flexible and adaptable.

Security Regulatory Framework must be RISK INFORMED and "OBJECTIVE BASED" at its heart.

Operator's Perspective on Regulatory Frame Work

Thoughts on How to Achieve "Objective Based" Regulations

- We already have strong risk informed framework in the area of Design and Nuclear Safety.
- We assess different designs and the nuclear safety threats to ensure that they can comply with defined "Safety Goals" or "Objectives". Events are not precluded but we ensure that risk is kept below an acceptably low threshold.
- Could we develop a "Security Goal"? A risk threshold against which a proponent could demonstrate that their proposed combination of "security by design", physical, cyber, on/off site response measures achieve the "Security Goal" for their unique situation. Rather than prescribing such measures.
- Mirroring the "Safety Goal" Approach has the advantage that the tools and techniques to assess compliance to the goal are already established and could be readily leveraged.

Physical Security Perspectives

Considerations

- SMRs cover a wide range of sizes, technology and locations.
- Security needs to be proportionate and specific to the circumstances.
- We need to ensure vendors; designers have the details needed to create robust 'security by design' that will support cost effective implementation by operators.

Clarity

- A need to determine basis for fewer security needs.
- To what extent can security by design decrease number of on-site security staff?
- If the plant has a PSA risk of 10-8 (much better than current), does that mean, we can justify fewer staff?
- If the plant is much simpler physically than a CANDU, having less equipment to protect, can we count that in terms of a smaller footprint?
- If the reactor is underground (largely) does that reduce the risk?
- If SMRs are located in remote communities, does this drive an increase, or decrease security requirements?

Physical Security Perspectives

Safeguards and Security

Some of these designs imagine being shipped already fueled.

- What security or safeguards considerations need to be applied to be applied for this? If the reactor core is intended to be decommissioned and shipped off-site with fuel still on board, how will the regulations apply to that?
- How to implement on large scale Transport of enriched fuel in Canada?
- Social licence around use of enriched fuel transport through indigenous communities?

Reducing security costs

- Some numbers we have seen for staffing of new SMR designs, imply that 15-30% of the total plant staff would security? This is unlikely to be cost effective for the large SMRs (eg 300MWe). It is absolutely not doable for vSMRs where the plant staff might be 10 per shift, or 1 per shift
- Is it conceivable that the one plant operator that shift is also the security guy?

Requirements

- How should nuclear Security regulations be revised to address these kinds of questions?
- Suggest flexible outcome-based approach to security as best practice.

Cyber Security Perspectives

Cyber Security is a serious concern to ensure critical operations is maintained.

Remote Access Security Considerations

- Could lead to some significant operational risk (i.e., critical systems directly connected to the Internet)
- Potentially exposes control system architecture to remote manipulation.
- Exploitable attack vector adding extra risk regarding availability of the control system.
- Security for remote access cannot impede or degrade the normal operations for critical control system functionality.
- Countermeasures (i.e., encryption) may cause unnecessary delays or shutdowns.

Cyber Security Perspectives (cont'd)

Field Programmable Gate Arrays (FPGAs)

- SMR designers are contemplating use to control the reactor
- Has ability to store configuration internally in nonvolatile flash memory and does not need encryption
- Limited use in an industrial setting for networking, motor control, imaging and communications.

Supply Chain and Vendors

- Major concern
- How do you manage and confirm the products received have not been maliciously manipulated prior to installation.
- Supply chain processes and vendor management require review.

Design Perspectives

When is the right time to consider Security in Design Process?

Concluding Remarks

- Ensure public safety and safeguards
- Protect our reactor investment
- We recognize the benefits of nuclear energy and SMRs in fighting climate change, we also **recognize that the cost of nuclear matters**.
- If we overload new designs with unnecessary safety and security it drives up cost; and we might not implement them, and the world benefit of nuclear is lost.

For this reason we need to figure out how to balance the cost and safety equation.

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